

HIGH COUNTRY GRAZING 'IN THE WESTERN UNITED STATES

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Between the deserts and the forests are vast expanses of basins, plateaux, and grasslands with a plant cover of grasses, broadleaved herbs, shrubs, and open, arid woodlands. The semi-arid grassland, the open woods, and the desert shrubland constitute the domain of the huge western livestock industry in the 17 states lying roughly west of the 100th meridian. These are known as the range states and they are likely to remain predominantly range states because of the low precipitation, rough topography, and shallow, rocky and saline soils.

Table 1-Major Uses of Land, 17 Western States*

Use	Millions of Acres	Approximate Percentage of Area
Cropland	188.4	16
Non-forested pasture and range	598.1	51
Forest	268.5	24
Non-agricultural	55.5	5
Little or no surface use	51.9	4
Totals	1162.4	100

About 9 per cent of the area is not of agricultural use. In fact, 5 per cent of the land in the west is used to provide sites for cities and towns, industry, farmsteads, highways, railways, parks, game refuges, airports, and military installations.

Much of the rangeland is federally owned. In the 11 westernmost states this totals almost 54 per cent, varying from a low of 35 per cent in Washington to a high of 85 per cent in Nevada. It amounts to 45 per cent in California. Grazing use of such land is by permit from the Bureau of Reclamation or the U.S. Forest Service. Such permits have usually been granted in order that the public land grazed together with

*Data from "Irrigation Agriculture in the West," U.S. Dept. of Agric. Misc. Publ. 670, November 1948.

the home ranch combine to make an economic unit for the runholder. In other words, a grazier will usually have sufficient hay and forage on the home ranch to carry the number of beasts for 8 months that the high country will carry for the 4 summer months.

As indicated above, land use in the mountainous areas of the range country is restricted by topography, soils, and climate. The mountains have many uses. Water runoff provides the main source of water for the lower country. In addition to being the source of minerals and a vast timber supply, they are used for livestock grazing during the summer. At all times they support big game, fish, and other wildlife. The natural wonders are another national asset of great importance to the urban dweller. Since by far the greater majority of Americans now live in the towns and cities, the mountain regions are one of the chief sources of recreation. Thus, these areas are managed on what is called a "multiple use" basis : watershed, timber, mining, recreation (hunting, fishing, camping, and hiking), and grazing. In some places, one or another of these functions may be restricted or lacking. Grazing, for instance, is excluded from the dense forests and most of the National Parks. Hunting is not allowed in the wildlife sanctuaries of the National Parks.

The mountainous range country varies in elevation from 3000 to 12,000ft; in the southern part the lower limits are about 6000ft, and in the northern latitudes the lower limits begin at 3000ft. Precipitation varies from 6 to more than 60in.

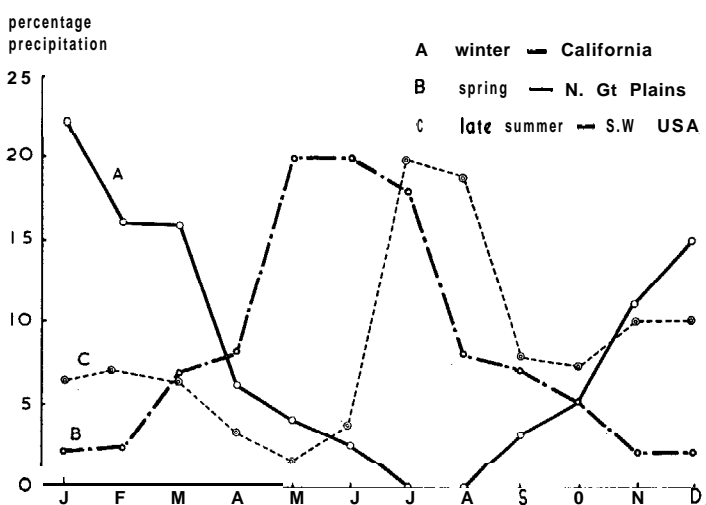
There are three broad precipitation patterns (Figure 1) which have profound effects upon vegetation type and season of use. Winter precipitation or the Mediterranean type is found over much of California, although summer thunder storms do occur in the mountains. In the northern Great Plains the heaviest precipitation occurs in spring, April to June. The late summer type is characteristic of the southwest, especially Arizona and New Mexico. The three types grade from one to the other, and storm intensities vary greatly.

The problems of livestock farming are many and varied, but three broad provinces are recognised (Price, Parker and Hull, 1938) .⁽¹⁾

The northern Rocky Mountains (and this would apply to the western slopes of the Sierra Nevada and the mountains in northern California as well) are characterised by high mountains, plateaux, and narrow intermountain valleys. The climate is rugged, with

sharp seasonal variations. Range types are predominantly open forest, bunchgrass, wet meadow, and sagebrush. Hereford is the prevailing breed of cattle, with some herds of Aberdeen Angus and Shorthorn. Rambouillet is the basic bred of sheep, but most ewe flocks are crossbreds-Rambouillet with the long wools Lincoln and Romney. These are then crossed with

MAJOR PRECIPITATION PATTERNS -WESTERN RANGE, U S.A



medium wools and mutton types such as Hampshire and Suffolk to produce market lambs. Sheep are run in bands of from 1000 to 1500 ewes with their lambs, herded day and night, and moved from place to place as the need for forage requires.

Cattle are generally fed hay on the home ranch for four months in the winter. In the spring they are turned out on the foothills and sagebrush ranges and then driven to the higher mountains for the 4 summer months. In the autumn they are driven to the foothill and sagebrush ranges for a month or two on their way back to the home ranch.

Shearing and lambing occur on the range and home ranch. Considerable shed lambing is practised to reduce losses and produce lambs for early market.

Competition for feed with deer and elk is an increasing problem in many places. The increase of

young trees and brush, due partly to control of fires, is reducing the available range. Low value plants such as cheatgrass, St. John's wort, and big sagebrush are invading lower ranges.

The Intermountain West embraces high mountains (6,000 to 13,000ft), broad plateaux, deep canyons, extensive valleys, and barren salt flats. The use of the same range by sheep and cattle is common. Sheep losses are high. In many instances the seasonal ranges are separated widely and although distances less than 100 miles are common animals may be trailed more than 250 miles over difficult terrain, thus reducing production. The problem of mixed land ownership here as elsewhere complicates their problems.

The mountains provide grazing in the summer for 3 to 5 months. Cattle are fed during the winter, but sheep are usually kept on the lower ranges in winter.

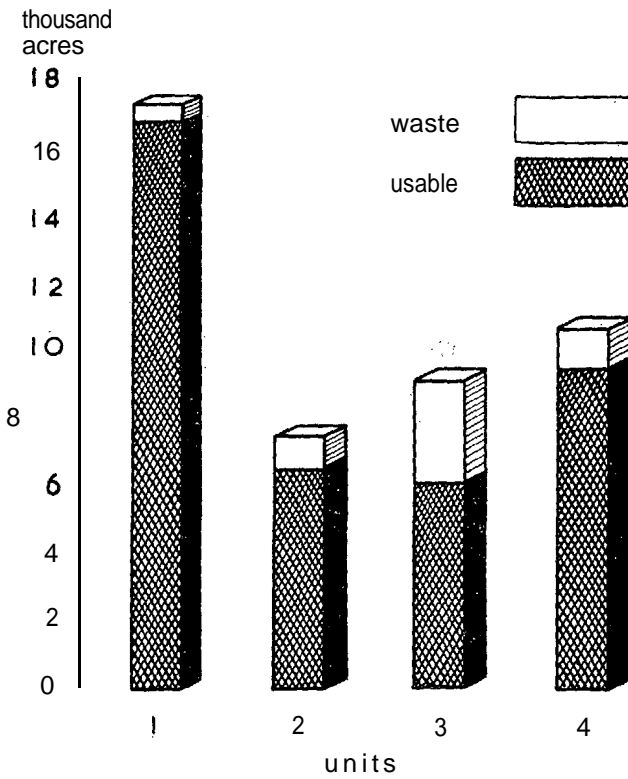
Actually, grasslands are rare and shrubs dominate vast areas in this Intermountain Province. But good grazing is found in the, open ponderosa' pine foothills, the aspen ranges at intermediate elevations, and the fir and spruce ranges at high elevations. Mountain ranges in good condition may support one animal unit month on one and two-thirds acres, but the waste land may reduce this greatly.

The Southwest Mountain province embraces large areas of low-lying desert and semi-desert, broad plateaux, and comparatively isolated mountain ranges. The climate is relatively warm and dry. Cattle and sheep graze yearlong. Drought is perhaps the biggest problem in this region. However, undesirable woody plants cover vast acreages: 70 million acres of mesquite (*Prosopis* spp.) in Arizona, New Mexico and Texas; at least 5.5 million acres of burroweed (*Aloppappus tenuisectus*), and 4.5 million acres of snake-weed (*Gutierrezia* sp.) in Arizona alone ; 60 million acres of prickly pear and arborescent or "cholla" cactus (*Opuntia* spp.) in Texas alone.

It is really impossible to present adequately a picture of this vast and varied range area. Three allotments will be discussed in some detail.

An allotment in the Humboldt National Forest, northern Nevada, illustrates the variability encountered by one runholder in his different grazing units (Figure 2). Only 1.6 per cent of the acreage in unit 1 is waste land, unsuitable for grazing, but 33.3 per cent of unit 3 is waste, primarily because of steep slopes

ALLOTMENT IN HUMBOLDT NATIONAL FOREST,
NEVADA , U.S.A.



**Table Z-Vegetation Types, Little North Fork Allotment,
Klamath National Forest, Northern California.**

Vegetation Type	Acres	Percentage of Allotment
Grassland	7	0.06
Dry Meadow	42	0.37
Wet Meadow	390	3.51
Broadleaf Weeds	505	4.61
Wastee (Approx.)	10,000	89.98
	11,100	100.

and rough topography. The 44,580 acres in the 4 units support the equivalent of 2,328 cows for 4 months, or



Summer grazing area in Klamath National Forest. Forest Ranger checks the permittee's cattle on the North Fork of Coffee Creek.

one animal month for every 4.7 acres. Rainfall (30-year average) amounts to 6.34in.

An allotment in the Klamath National Forest, Northern California, illustrates the variability in vegetation type and the relatively small, scattered areas of good grassland and meadow.

The 11,100 acres carry 250 cows with their 4-month-old calves for 3 months. The season is usually 15 July to 15 October. Every year the Resource Manager and Forest Ranger make a trip to the allotment on horseback with the stockman and set the opening date of the range. Last year was very dry and the cattle went in

at the earliest date, 6 June. In 1954 there were heavy snows and the cattle were not put in to the allotment until 24 July.

It would be beneficial to rotate and defer all of the individual units, but this is impractical. Because of the rough nature of the country and the drainages running from it in all directions, experience has shown that it is almost impossible to gather cattle on the western units. They tend to work down the creeks after the green, frost-free feed period ends late in the fall. It has been a management necessity to gather in units 5, 6, and '7. So these units are grazed late every year, 15 September to 15 October. The feed is mature at this time and the practice is not harmful to the range.

Again, because of the topography, the remaining units are grazed in two lots ; 2 and 3, and 1 and 4. They are rotated on a 3-year basis for the first 2 months. For example, units 2 and 3 will be used early (16 July to 15 August) in 1955 and 1956, and units 1 and 4 will be grazed later (16 August to 15 September). For three seasons beginning in 1957 units 1 and 4 are to be utilised 16 July to 15 August, and units 2 and 3 will be deferred until 16 August. This 2-months' rotation of the eastern units on a 3-year basis allows the range forage plants to throw almost an entire crop of seed as the range begins maturing the middle of August. It also provides a year in which new plants may become established.

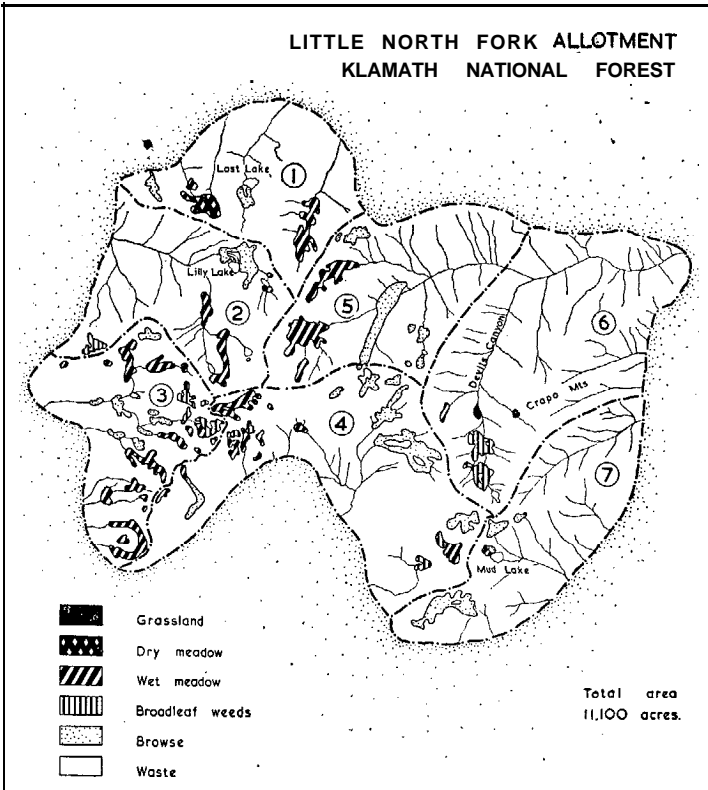
The permittee pays a fee per cow month based on a formula that takes into account the selling price of the animals the preceding season. I do not have the exact figures, but beef cattle brought about 22 cents a pound last year (approximately 1s. 7d.) and the grazing fee this year was about 42 cents per cow month (3s.). Permits are customarily renewed annually and even handed on from father to son. The U.S. Forest Service, however, has the final decision as to how many animals are to run on the allotment and number of days allowed.

With relatively low fees the runholders feel they can afford to trek animals the long distances through rugged country to the summer grazing allotment. More than that, it is as important and glamorous a life to the American runholder as to his New Zealand counterpart who runs in the high country so ably described by David McLeod.⁽²⁾

Although 90 per cent of this allotment is unusable as range, the cattle do not traverse more than 35 per

cent of the 11,100 acres in foraging for the feed found on the 10 per cent of the area. And so, although 44.4 acres of the total are required to support a cow and her calf for the 3 months, actually 4.4 acres provide the necessary forage.

Patience and many years of experience are required in improving this type of range with its short



season of growth. From bare ground to full cover takes many years. The plant succession is a beautiful and spectacular one. First, a tiny, prostrate, herbaceous plant called pussypaw (*Spraguea multiceps*) invades and finally covers the ground. Only then is the soil capable of supporting the large herbaceous plants of false hellebore (skunk cabbage) (*Symplocarpus foetidus*) and *Angelica* which crowd in and finally take over from the little invader pussypaw. And only when these and other tall, broadleaved plants are growing in

great abundance do grasses such-as *Bromus marginatus* (mountain brome) , *Danthonia californica* (California oatgrass)—very different from your *D. rigida* (red tussock) —*Festuca idahoensis* (Idaho fescue) , and ***Agrostis diegoensis*** (leafy redtop) invade the area. And only on certain sites and faces do the grasses gain dominance. On, one site it may be the Idaho fescue, on another the California oatgrass, depending on the soil and- face. On many areas the grasses never gain dominance, but share the space, the nutrients, and moisture with a profusion of flowering plants that make the dry meadows a veritable nature-lover's paradise: In this region, fortunately, legumes are present : especially species (both perennial and annual) of *Trifolium*, *Lupinus*, ***Lotus***, and *Vicia*.

I am indebted to Mr A. L. Crebbin, Resource Manager, Klamath National Forest, not only for supplying details of the Little North Fork allotment, but for the privilege and pleasure of learning about the high country by the pack trips riding over this and other allotments during recent summers. Mr Crebbin, and others like him, are doing a wonderful job interpreting Government policy and working with the run-holders in improving the valuable range resource.

The Harvey Valley Allotment in the Lassen National Forest, northeastern California, in timber-sagebrush country, illustrates the newer, dynamic type of research that is being conducted to improve parts of the high country.

Table 3—Vegetation Types, Harvey Valley Allotment, Lassen National Forest, Northeastern California.

Vegetation Type	Acres	Percentage of Allotment
Grassland	505	1.5
Meadow	1,322	4.1
Sagebrush	4,105	12.7
Conifer	14,713	45.5
Waste	11,707	36.2
Totals	32,352	100.

Roughly one-third of the 32,000-acre allotment is barren and almost one-half is commercial timber, leaving about 6000 acres (about 18 per cent,) for grazing. This area carries 500 animal units for 4 months in the summer, but over the years the range has deterior-

ated even though the stocking rate is quite conservative.

The California Forest and Range Experiment Station (in co-operation with the University of California) began some grazing studies in this area in 1936.⁽³⁾ I want to emphasise the co-operative nature of this research: the C.F. and R.E.S. headed up the research in co-operation with personnel of the Lassen National Forest (on which grazing is administered by the Range Management Division of the Regional Office of the U.S. Forest Service) the runholders, and the Lassen County Farm Advisor (an officer of the University of California's Agricultural Extension Service). The studies were aimed at developing better grazing management and cultural procedures, such as artificial seeding and weed control, for improving and getting greater production on such mountain summer cattle ranges.

The grazing management studies have been designed to study the response of individual species to clipping at different dates and heights as well as a detailed study of the extent to which individual plants of the major species are grazed, especially under a so-called moderate stocking load or moderate grazing.

To those who feel that the only answer to so-called "range deterioration" is to reduce livestock numbers, the research findings come as a shock. The average height of the remaining plant growth of *Festuca idahoensis* (a "key" plant) at the end of the grazing season was 4in.' However, the following figures convey a different impression :

Stubble height	Percentage of plants
1in.	40
2in.	29
3in.	13
4in. or higher	3
ungrazed	15

Other studies had shown that clipping Idaho, fescue plants to 1.5in. of stubble was definitely harmful to the plants. So, although average utilisation of the stand was only 43 per cent, actually over 40 per cent of the plants were harmfully grazed.

'As a result of these preliminary studies lasting through several seasons, a pilot model range management study was set up to test the application of the research findings on a larger scale. Suffice to say,

the results were so encouraging that the entire allotment was cross-fenced in such a manner as to provide five units with comparable productivity. **Livestock numbers were not reduced,** but a rotation-grazing schedule was set up based on the growth habits; primarily, of Idaho fescue:

Table 4—Grazing Schedule for Five Units*—

Year	Unit				
1st	A	B	C	D	E
2nd	B	C	D	E	A
3rd	C	D	E	A	B
4th	D	E	A	B	C
5th	E	A	B	C	D

The treatments (A through E in table 4) and their main purposes are as follows:

- A. Heavy use season-long to provide maximum forage utilisation.
- B. Rest season-long to allow recovery of plant vigour.
- C. Rest until mid-season to permit plants to ripen seed. Heavy use after mid-season to plant seed by heavy trampling.
- D. Rest season-long to allow grass seedling establishment.
- E. Graze moderately until mid-season to aid establishment of young plants. Rest second half of season to allow increase of plant vigour.

In the short time allotted to me I have tried to present :

1. A picture of our high country in the western United States,
2. some of the problems facing our permittees or runholders, and
3. some of the more dynamic research that is now being conducted.

If I may, I should like to make a few observations of my own with regard to grassland agriculture.

First of all, please note the term "grassland agriculture." I am convinced that the same fundamental principles found to be so effective in other places of agriculture also apply to grassland agriculture. Not the least important problem connected with such crops as barley or lucerne is the harvesting problem. Leave that unsolved, and little economic good will come

*Letters represent grazing treatments. Explanation in text

from the use of certified improved strains. Certainly the better plains farmers observe good field husbandry practices so that the soil will continue to yield good crops. Nevertheless, their emphasis is not on soil conservation, but in obtaining crop yields of good quality year after year. The harvesting problem in grassland is **tremendously** difficult. Stated in its simplest terms it is this: to overcome the **tendency** of animals to graze selectively. Given free **choice** an animal (sheep or cattle) will graze the most palatable plants first. Reduce the livestock load and still the palatable plants are "overgrazed." The best way to avoid continued abuse of the palatable plants is to rotate the animals from field to field. When the best plants have been closely grazed the animals must take the "second-best." Then, if the stock are moved to a new pasture the plants can recover. I realise this calls for **cross-fencing** of huge, low-production areas. In my opinion this is one of the best conservation **measures** that can be undertaken.

I have defined range improvement as "the process of replacing a relatively undesirable population of plants with a more desirable type of forage."⁽⁴⁾ Emphasis on **improvement** has much more appeal to the grazer than emphasis on protection. If the grazing **programme** improves production per acre, it automatically takes care of the problem of conservation. The *status quo* can no more be maintained in grassland agriculture than in any other walk of life. We either go forward or backward. There, is no standing still.

References

- (1) Price, R., Parker, K. W., and Hull, A. C. Jnr.: Range practices and problems. GRASS, Yearbook of Agriculture, U.S.D.A. 1938, pp. 557-560.
- (2) McLeod, David: New Zealand Nigh Country. Canterbury Agricultural College Publication, 1951.
- (3) Hormay, A. L.: How livestock grazing habits and growth requirements of range plants determine sound grazing management. J. Range Management 9: 4: 161-163, 1956.
- (4) Love, R. M.: Range Movement Standards. The Appraisal Journal 22: 3: 409-414, 1954.

DISCUS&ON

- Q. On what basis in your system of management do they judge mid-season, or when do they know to start the grazing period or the resting period? You gave fixed dates. Is that normally done or do they use an indicator plant which indicates the time of season and not the calendar?
- A. (Lincoln Ellison, U.S.A.) : A study was made of the correlation between plant growth and other factors so as to

set a calendar date at which the range can be opened. In some places it is possible to vary the date but in many it is not. At these places it has to be done on a time basis. The summer grazing period is rather short.

Q. What is the security of tenure on the allotments for summer country? That is one of the problems that is faced in New Zealand by the high-country farmer of recent years. He is placed in a difficult position as much of the country which is used extensively for high summer use is not on a permanent basis and open to depredations of other interests, such as playground, forestry or soil conservation. In New Zealand it is possible most of the time to graze high country. Grazing is not sufficiently rotational and summer pastures are also used in winter. While this transitional period of development is going on with the introduction of new grasses and breeds, we should have a standstill period over which we are assured of absolute security of summer and winter country. Would that be achieved under the American system?

A. No, I think not. The tendency at home is for our runholders to become more and more dependent on their own resources and less dependent on public lands. In California there are actually fewer people going to the mountains in summer. There is an Advisory Committee set up in each area on which the runholders are represented as well as forest rangers and research people.

Lincoln Ellison, U.S.A.: In California the tendency to withdraw from the mountains is more marked than elsewhere in the West. There has been a great deal of loose talk in the press about lack of security in the grazing of mountain lands and national forest lands. We have been studying these lands for many years and now have a better appreciation of what the grazing capacity is. Changes are usually made with the co-operation of the runholder. The privilege of grazing is granted to people with substantial economic units, such as a home ranch. Permits have remained in the same family for several generations and command high premiums. If the insecurity were a big factor they would not command the high price.

Q. Can you give us any idea of what you think about the recovery of our native grasslands. Can we improve ours as much as we should like?

A. You can do a lot. You could spend a few thousands of the two million pounds which is going to be spent to prevent the lower Waimakariri flooding to finance fences on the hills to prevent livestock moving.